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Cameron

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(54) **BOX WITH FULL-HEIGHT SIDE SUPPORTS AND BLANK AND PROCESS FOR FORMING SUCH BOX**

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B65D 5/44 (2006.01)
B65D 5/54 (2006.01)

(52) **U.S. Cl.**
CPC ***B65D 5/443*** (2013.01); ***B65D 5/5405*** (2013.01)

(58) **Field of Classification Search**
USPC 229/162.1, 103.2, 240, 242, 190–198, 229/915, 918; 206/746, 774
See application file for complete search history.

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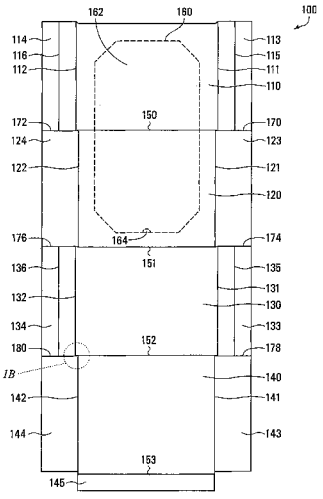
Primary Examiner — Christopher Demeree
Assistant Examiner — Phillip Schmidt

(57) **ABSTRACT**

Blanks are provided for forming boxes with side supports formed from flaps extending from the front and back of the box. The side supports are on the outside of the box and are of full height, i.e., as tall as the total height of the box, or flush with the top and bottom of the box. The side supports may be double-layer supports formed by folding the flaps. Boxes having full-height side supports and processes for forming such boxes are also provided.

17 Claims, 11 Drawing Sheets



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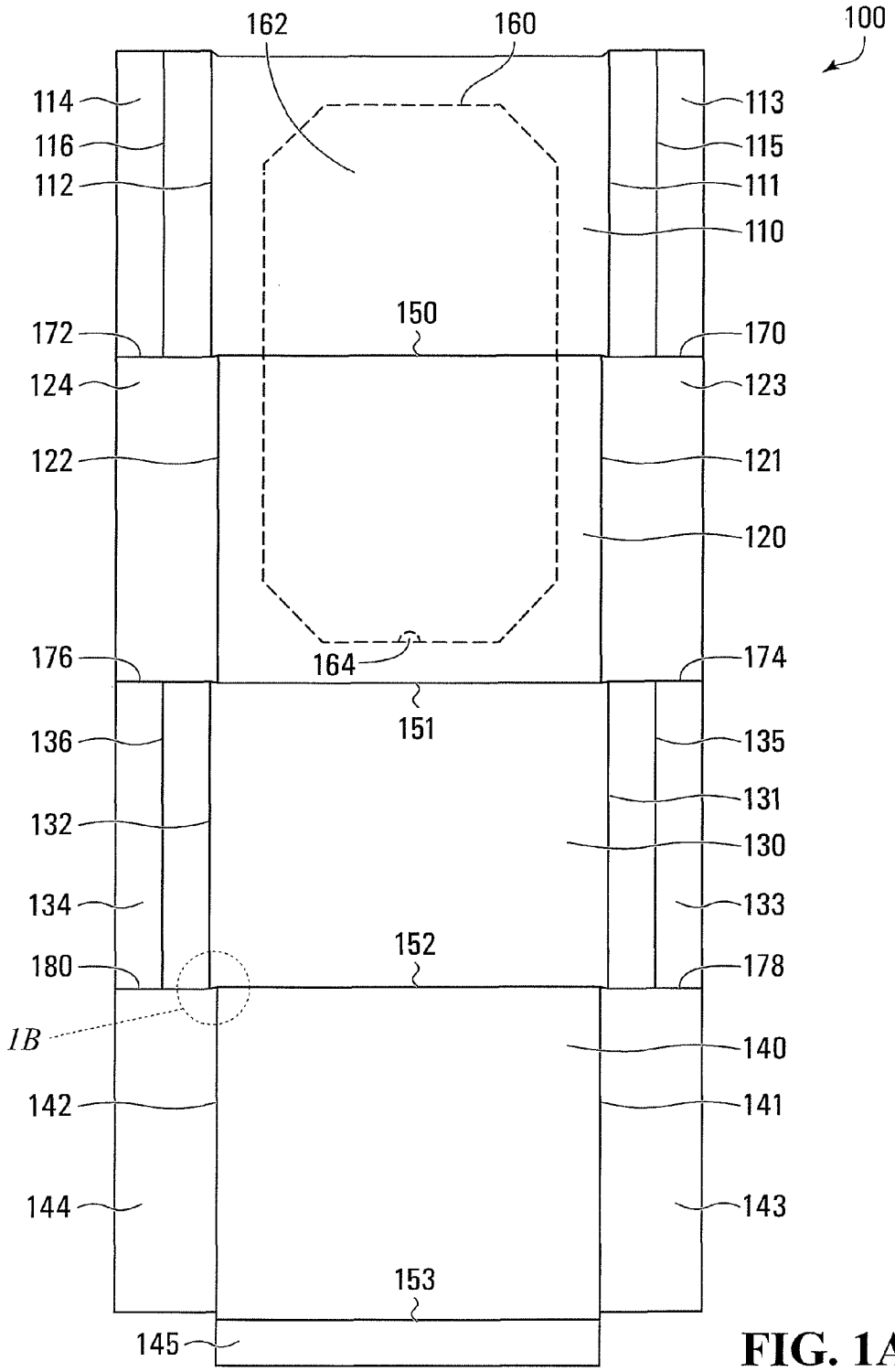
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FIG. 1A

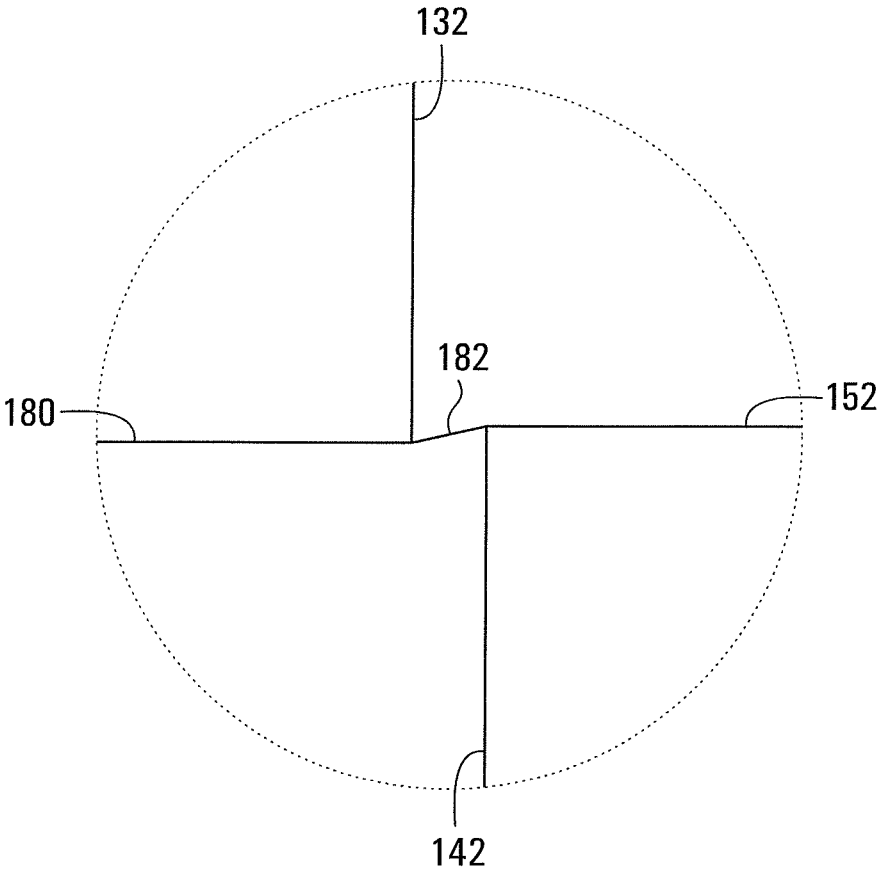

FIG. 1B

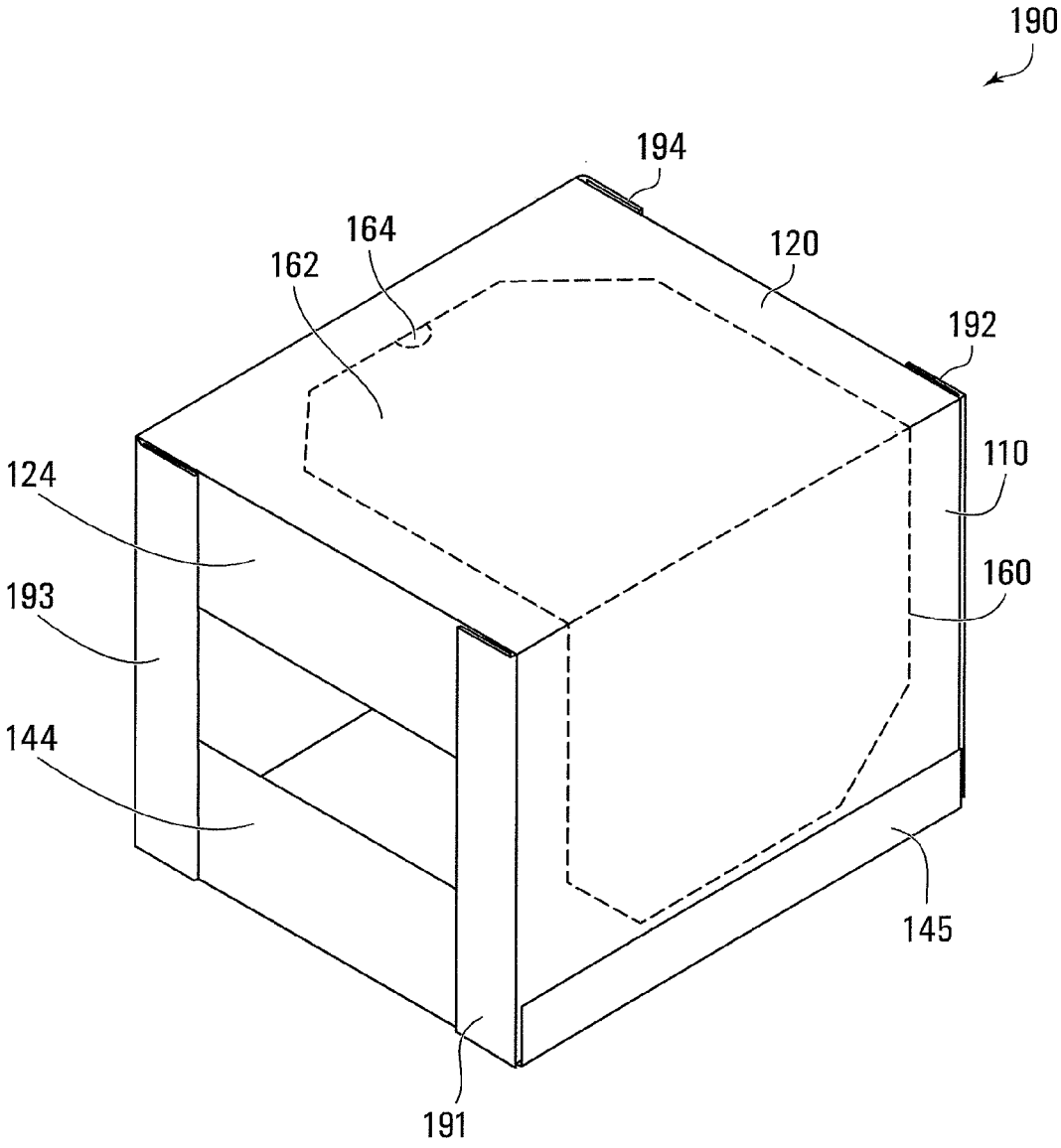

FIG. 1C

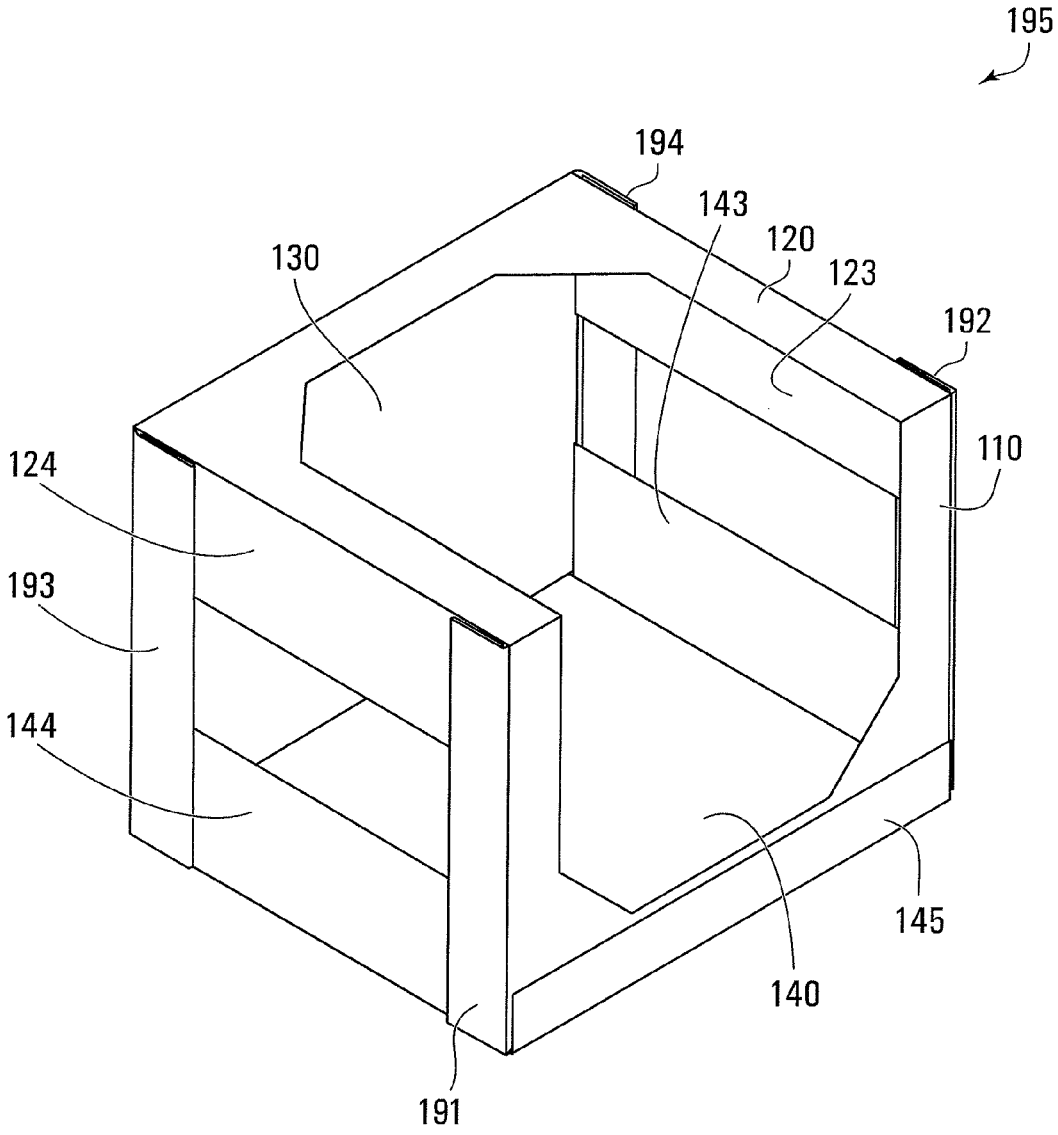

FIG. 1D

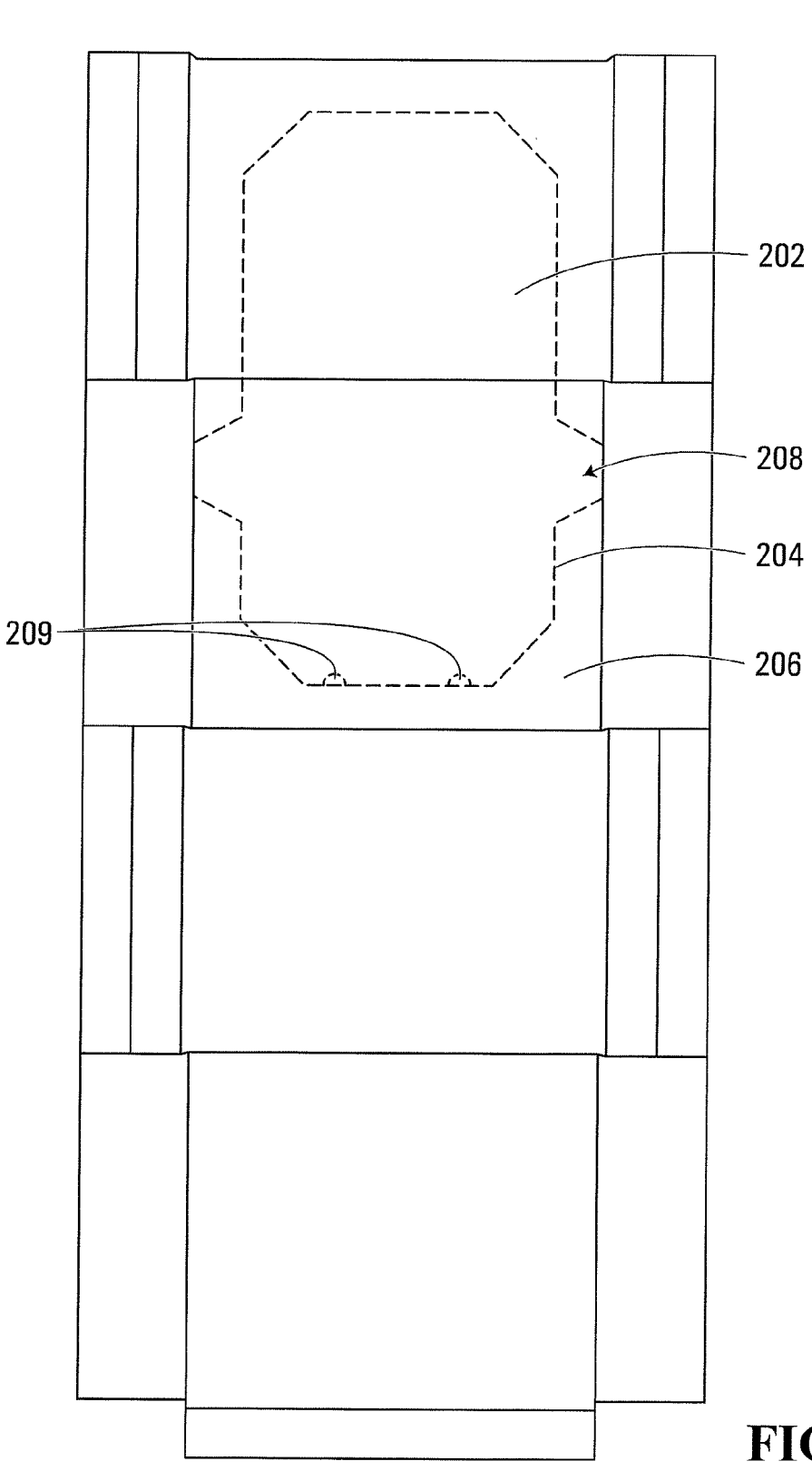

FIG. 2A

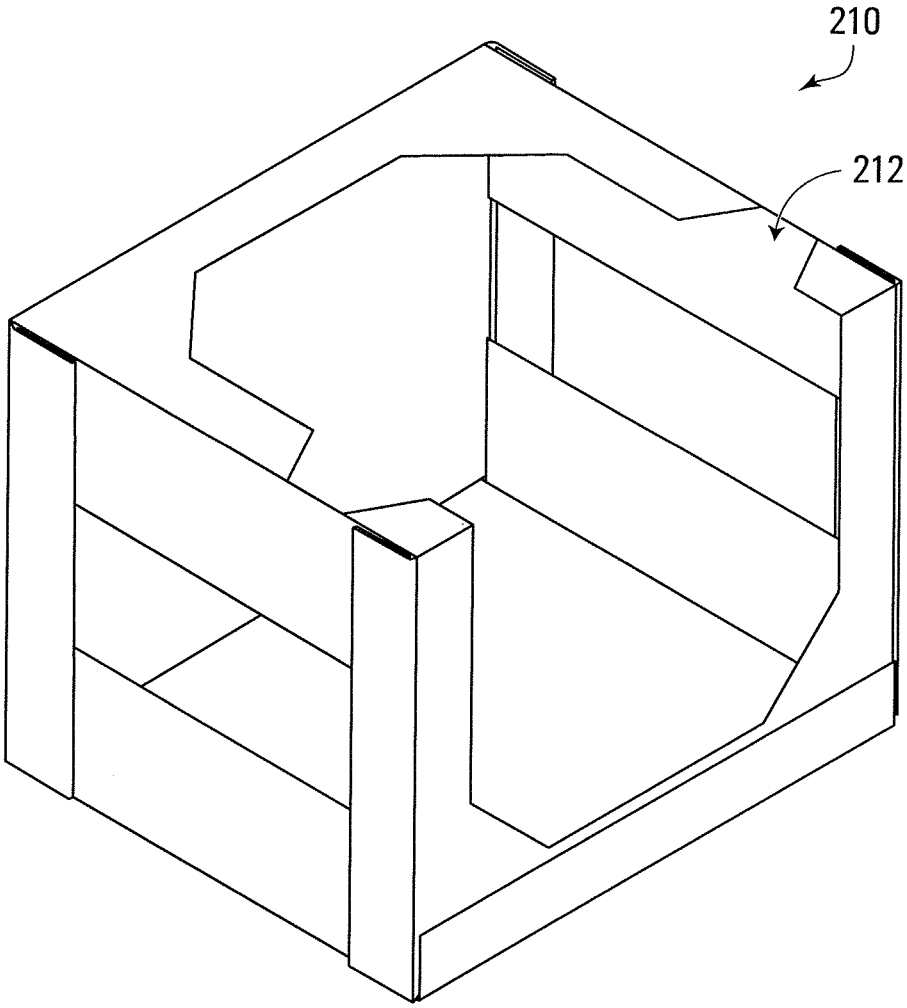

FIG. 2B

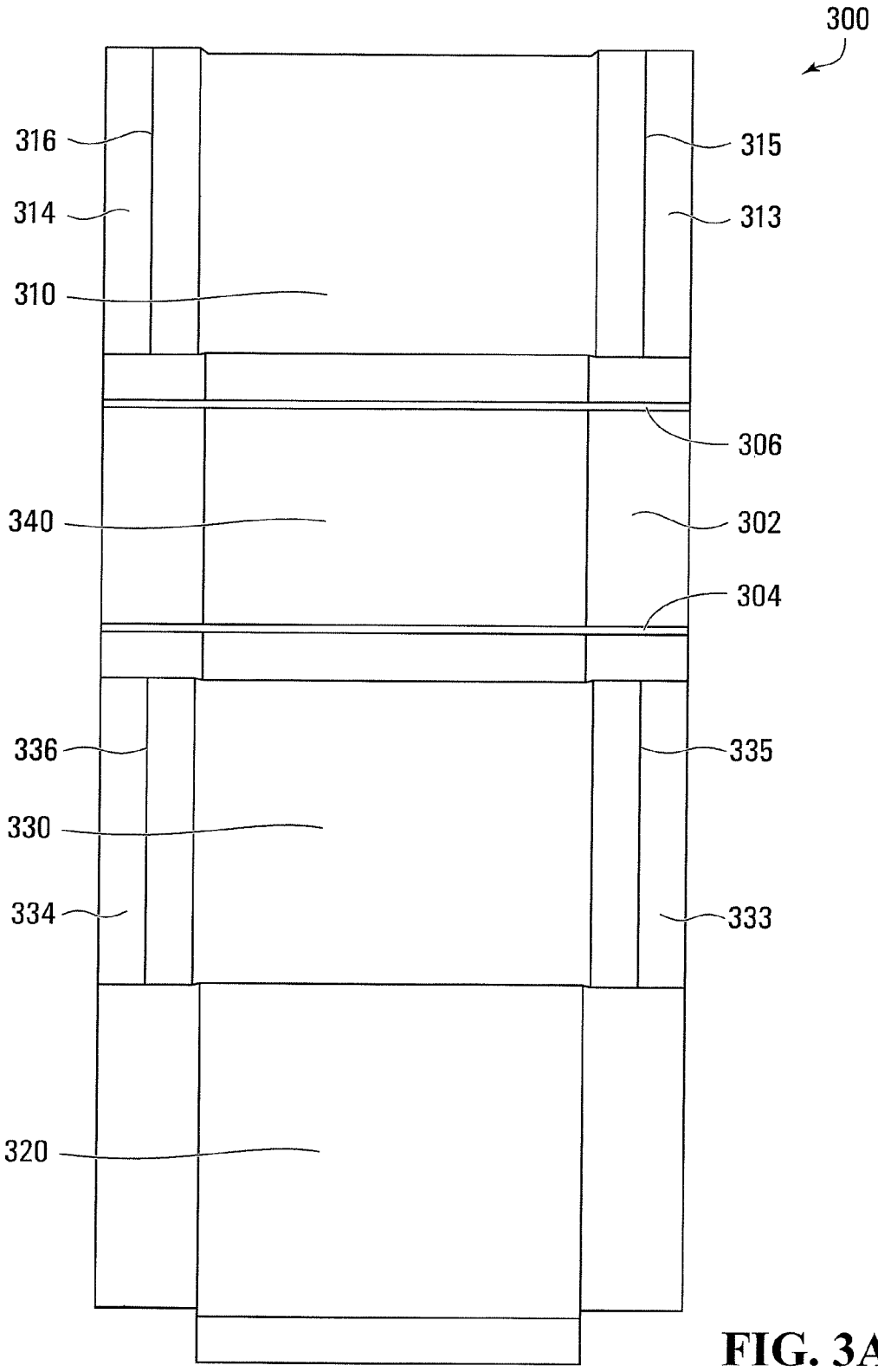

FIG. 3A

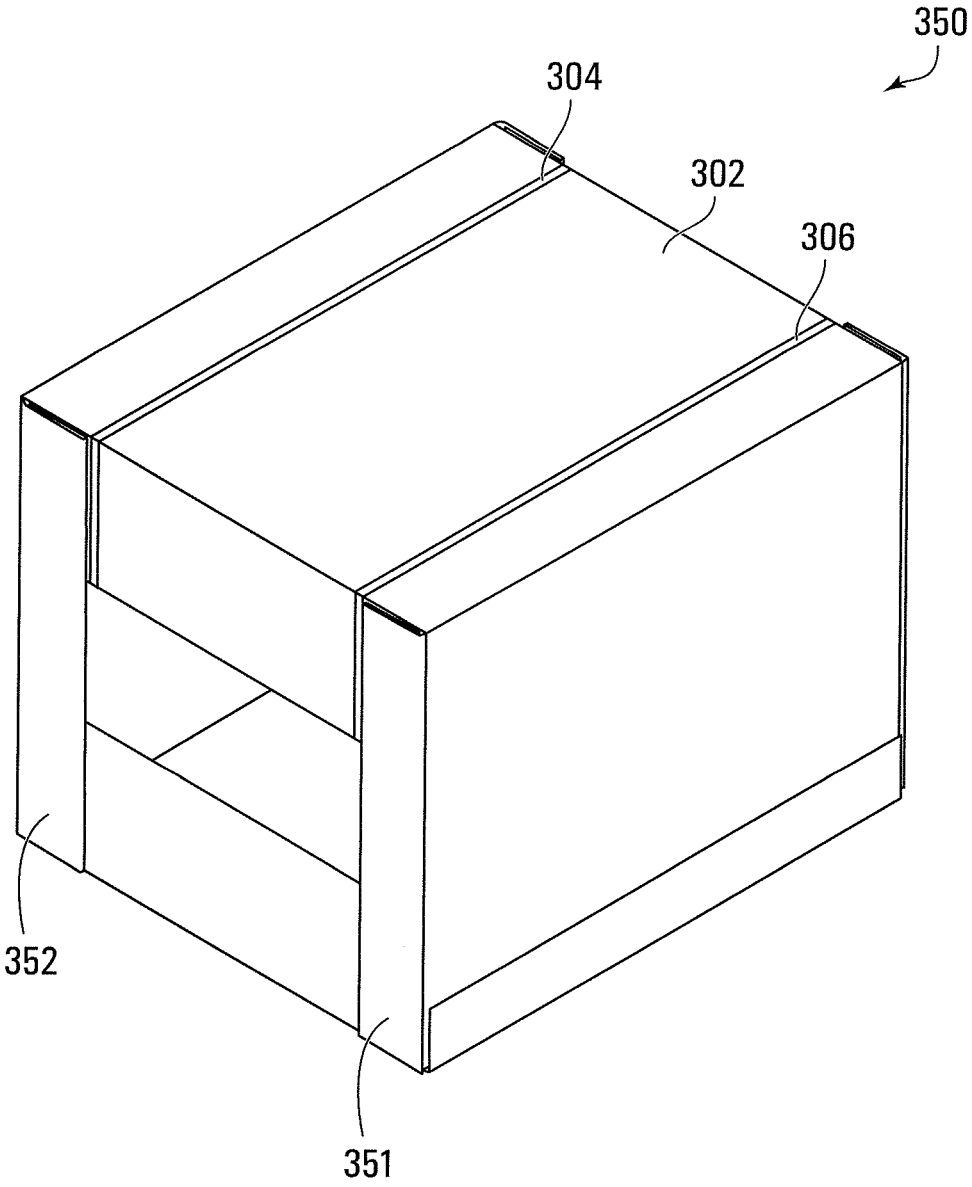

FIG. 3B

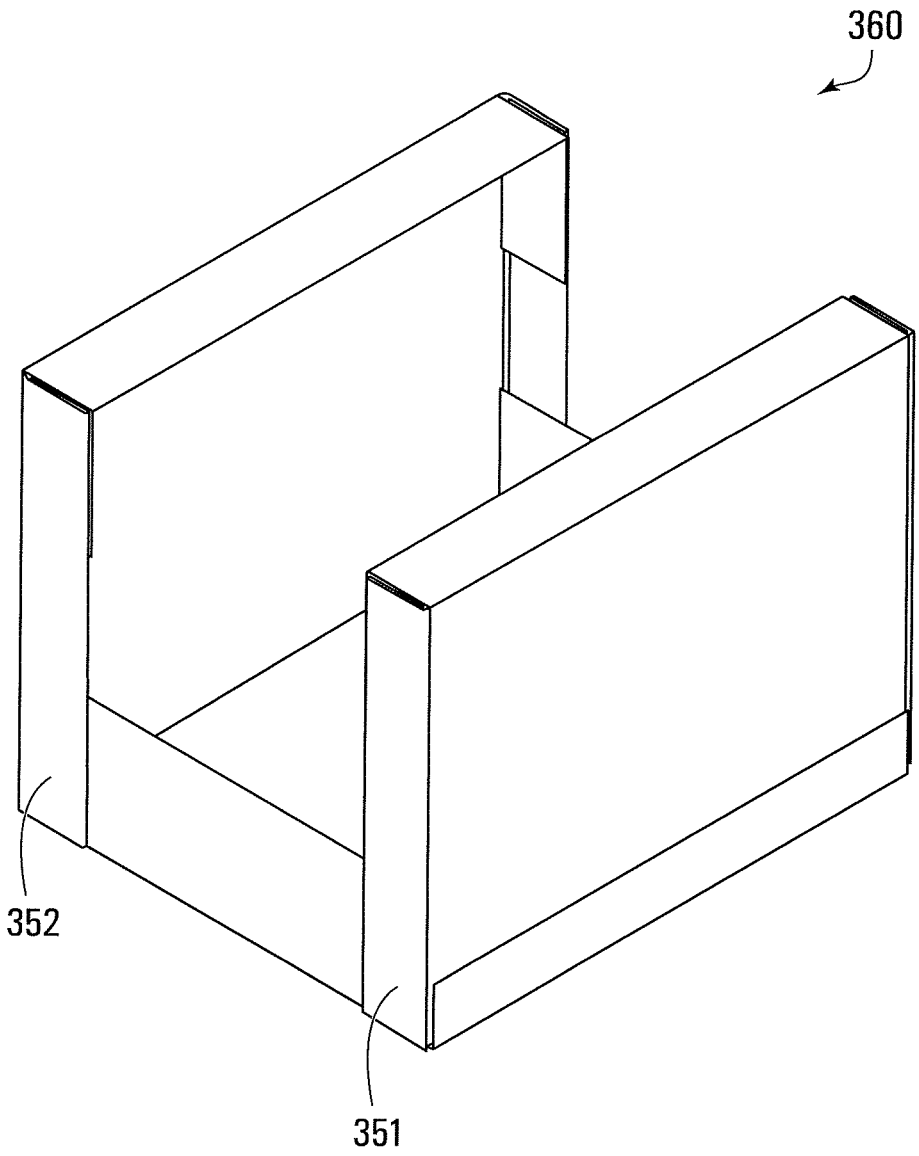

FIG. 3C

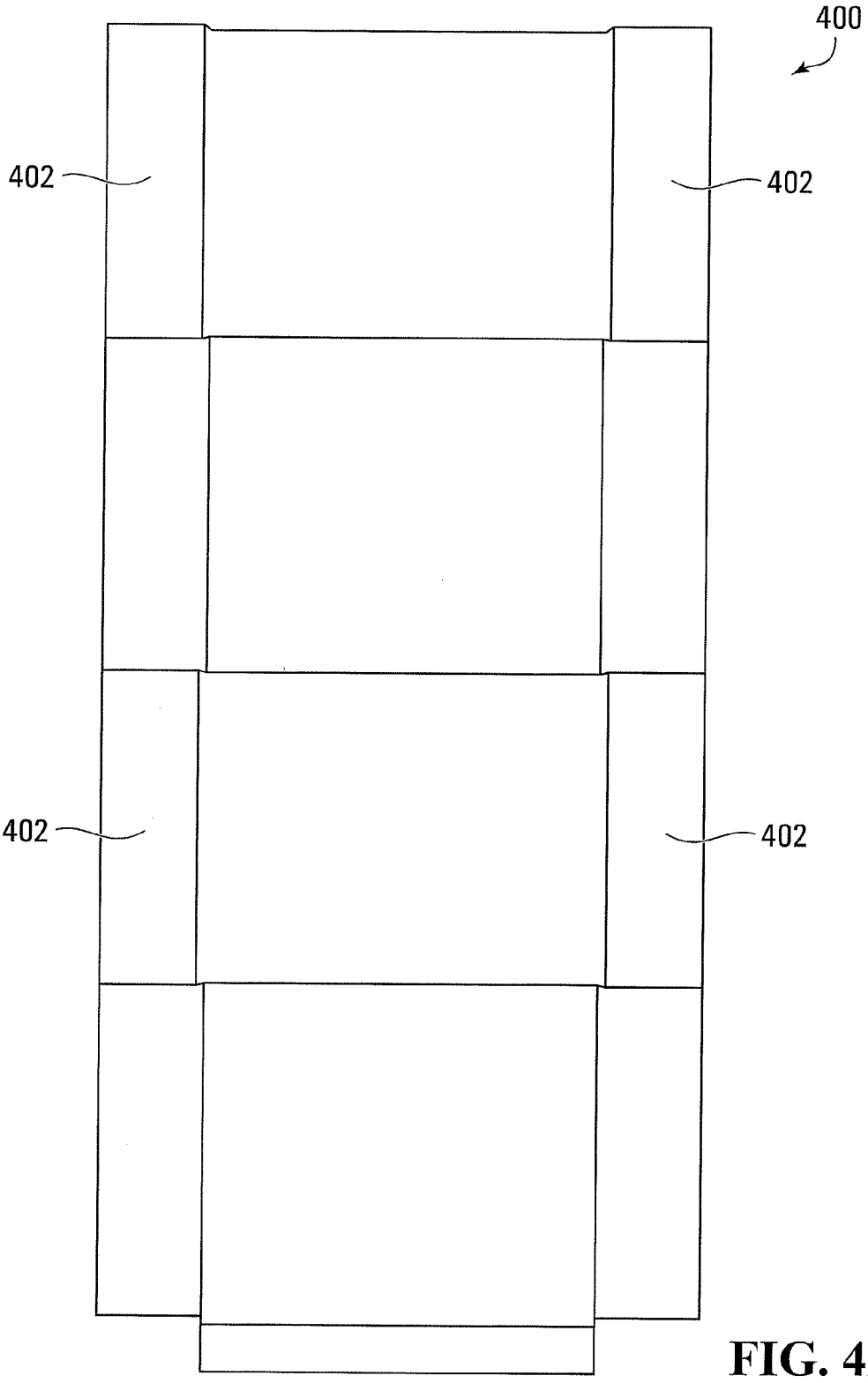

FIG. 4A

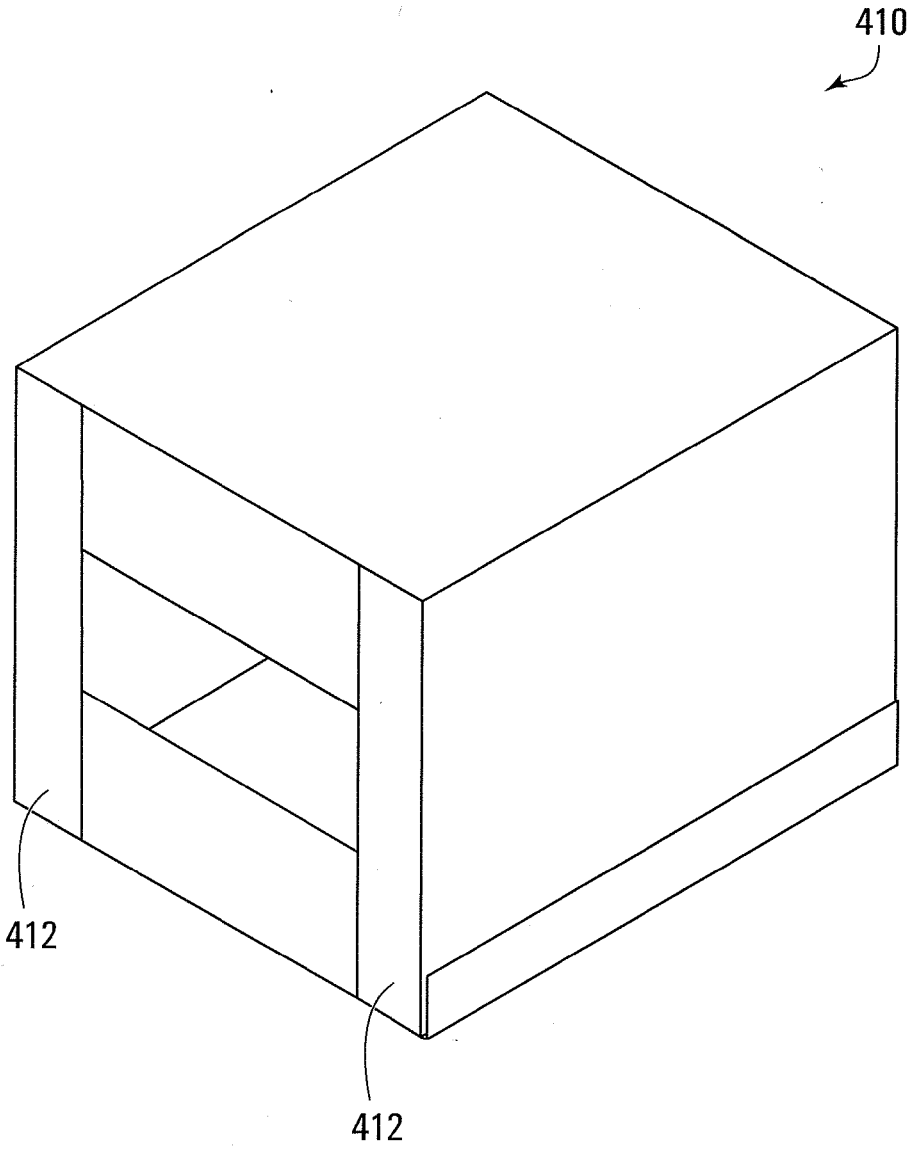

FIG. 4B

BOX WITH FULL-HEIGHT SIDE SUPPORTS AND BLANK AND PROCESS FOR FORMING SUCH BOX

FIELD

The present invention relates to boxes, and blanks and processes for forming boxes.

BACKGROUND

Cardboard or paperboard boxes are useful for shipping and storing goods or products. It is common to form such a box from a single blank. Typically, the blank has four main panels for forming the top, bottom, front and back of the box, and has side panels extending from the main panels for forming the sides of the box. The adjacent flaps are separated by wide gaps (or slots) for ease of production and assembly. Tear lines may be provided on the blank so that a portion of the box may be removed along the tear lines to convert a packaging box to a display box. Such blanks and boxes are disclosed in, for example, WO 01/87721 to Maus, and U.S. Pat. No. 7,784,676 to Borek et al. In some situations, the known blanks and boxes such as those disclosed in the above references are adequate, but in some situations, they are either not suitable, or do not provide sufficient box strength to resist deformation under an applied pressure during use.

SUMMARY

In an aspect of the present application, there is provided a blank for forming a box. The blank comprises a plurality of panels joined to one another at respective fold lines, said panels comprising a top panel for forming a box top, a bottom panel for forming a box bottom, a front panel for forming a box front and a back panel for forming a box back, each one of said panels having two side edges; and a plurality of flaps each extending from one of said side edges, for forming box sides, wherein flaps extending from said front and back panels are as tall as the total height of the box to be formed from said blank.

In another aspect of the present application, there is provided a blank for forming a box. The blank comprises a plurality of panels joined to one another at respective fold lines, said panels comprising a top panel for forming a box top, a bottom panel for forming a box bottom, a front panel for forming a box front and a back panel for forming a box back, each one of said panels having two side edges; and a plurality of flaps each extending from one of said side edges, for forming box sides, wherein flaps extending from said front and back panels are taller than said front and back panels and have ends each offset from said fold lines by at least about a thickness of said blank.

In an embodiment of a blank provided herein, a fold line may be provided on each flap extending from said front panel or said back panel, for folding the flap along said fold line to form a double-layer support. The fold line on the flap may be configured for folding the flap inward. The blank may comprise a tear line defining a removable portion in said top and front panels, for removing said portion from said box along said tear line. The blank may have a substantially uniform thickness. The flaps may be separated from one another by slits. Flaps extending from said top and bottom panels may be minor flaps. The blank may be formed of a corrugated cardboard having a flute direction substantially perpendicular to said fold lines joining said panels.

In a further aspect of the present invention, there is provided a box comprising a top, a bottom, a front, a back, and two sides each comprising a top flap extending downward from said top, a bottom flap extending upward from said bottom, a back flap extending forward from said back, and a front flap extending rearward from said front, wherein said back and front flaps are affixed to outside surfaces of said top and bottom flaps, and are as tall as the total height of said box.

In another aspect of the present invention, there is provided a box comprising a top, a bottom, a front, a back, and two sides each comprising a top flap extending downward from said top, a bottom flap extending upward from said bottom, a back flap extending forward from said back, and a front flap extending rearward from said front, wherein said back and front flaps are affixed to outside surfaces of said top and bottom flaps, and have top and bottom ends flush with said top and bottom respectively.

In an embodiment of a box provided herein, the front and back flaps may be folded inwardly to form double-layer supports. The front and back flaps may be glued to said outside surfaces of said top and bottom flaps. The box may comprise a tear-line for removing a portion of said top and a portion of said front. The top and bottom flaps may be minor flaps. The box may be formed of a corrugated cardboard, and the flute directions in said front and back flaps may be substantially vertical. The box may be formed from a blank described herein.

In a further aspect of the present invention, there is provided a process for forming a box from a blank comprising at least four panels and flaps extending from opposite edges of each one of said four panels, wherein said four panels are foldable to form a top, a bottom, a front and a back of the box. The process comprises folding flaps extending from said top and bottom to form two partial sides; and folding each flap extending from said front or back to form a side support and attaching said side support to an outside surface of a respective one of said partial sides. The blank is configured such that said side support is as tall as the total height of said box.

In another aspect of the present invention, there is provided a process for forming a box from a blank comprising at least four panels and flaps extending from opposite edges of each one of said four panels, wherein said four panels are folded to form a top, a bottom, a front and a back of the box. The process comprises folding flaps extending from said top and bottom to form two partial sides; and folding each flap extending from said front or back to form a side support and attaching said side support to an outside surface of a respective one of said partial sides. The blank is configured such that said side support has a top end flush with said top and has a bottom end flush with said bottom.

In an embodiment of a process provided herein, each flap extending from said front or back may be folded to form a double-layer side support. Attaching may comprise bonding with an adhesive. The blank may be a blank described herein.

Other aspects and features of the present invention will become apparent to those of ordinary skill in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

In the figures, which illustrate, by way of example only, embodiments of the present invention,

FIG. **1**A is a plan view of a blank for a box, exemplary of an embodiment of the present invention;

FIG. **1**B is an enlarged view of the portion **1**B of the blank of FIG. **1**A;

FIG. **1**C is a perspective view of a box formed from the blank of FIG. **1**A, exemplary of an embodiment of the present invention;

FIG. **1**D is a perspective view of a display box formed from the box of FIG. **1**C by removing a portion thereof, exemplary of an embodiment of the present invention;

FIG. **2**A is a plan view of another blank for a box, exemplary of an embodiment of the present invention;

FIG. **2**B is a perspective view of a box formed from the blank of FIG. **2**A, exemplary of an embodiment of the present invention;

FIG. **3**A is a plan view of a further blank for a box, exemplary of an embodiment of the present invention;

FIG. **3**B is a perspective view of a box formed from the blank of FIG. **3**A, exemplary of an embodiment of the present invention;

FIG. **3**C is a perspective view of a display box formed from the box of FIG. **3**B by removing a portion thereof, exemplary of an embodiment of the present invention;

FIG. **4**A is a plan view of a further blank for a box, exemplary of an embodiment of the present invention; and

FIG. **4**B is a perspective view of a box formed from the blank of FIG. **4**A, exemplary of an embodiment of the present invention.

DETAILED DESCRIPTION

In brief overview, boxes with full-height side supports are found to be able to withstand stronger vertical compression without substantial deformation, as compared to a box with side supports or flaps that do not extend over the full height of the box. Blanks for forming boxes with full-height side supports are disclosed herein. Full-height side supports have top and bottom ends that are flush with the top and bottom of the box. In other words, the full-height side supports are as tall as the total height of the box.

FIG. **1**A depicts a box blank **100**, exemplary of an embodiment of the present invention. Blank **100** has a plurality of panels including front panel **110**, top panel **120**, back panel **130**, and bottom panel **140**, which serially extend in a direction referred to as the lengthwise or longitudinal direction herein.

The terms "lengthwise", "length", "longitudinal", "widthwise", "width", and "transversal" are used herein for ease of reference, and it should be understood that it is not necessary that the length of blank **100**, or any component thereon, is longer than the corresponding width. In some embodiments, a length may be equal to or shorter than a corresponding width of the same blank or a given portion of the blank.

As depicted, each panel **110**, **120**, **130**, **140** has two side edges **111**, **112**; **121**, **122**; **131**, **132**; **141**, **142**. A flap **113**, **114**, **123**, **124**, **133**, **134**, **143**, or **144** extends from each respective side edge **111**, **112**, **121**, **122**, **131**, **132**, **141**, or **142**.

As depicted in FIG. **1**, front panel **110** and bottom panel **140** are terminal (end) panels, but in different embodiments, box **100** may be assembled in a different orientation such that the terminal panels are the top and back panels in assembled form. Optionally, an end flap such as end flap **145** may extend from a terminal panel such as bottom panel **140**, which may be used to join the ends of panels **110** and **140**, and form a joint known as the manufacturer's joint.

Each flap **113**, **114**, **133**, **134** has a fold line **115**, **116**, **135**, **136** thereon, for folding the respect flap to form a double-layer support.

Fold lines **150**, **151**, **152** are provided between adjacent panels **110**, **120**, **130**, **140** for folding panels **110**, **120**, **130**, **140**. In other words, panels **110**, **120**, **130**, **140** are joined to one another at respective fold lines **150**, **151**, **152**. When end flap **145** is provided, an optional additional fold line **153** may be provided for folding end flap **145**.

Fold lines (not separately numbered) are also provided at side edges **111**, **112**, **121**, **122**, **131**, **132**, **141**, and **142** between the panels **110**, **120**, **130**, **140** and their respective flaps **113**, **114**, **123**, **124**, **133**, **134**, **143**, and **144**.

Optionally, as depicted, a tear line **160** may be provided on blank **100**, which may form a closed loop enclosing a removable portion **162** of front panel **110** and top panel **120**, such that removable portion **162** can be conveniently removed along tear line **160** during use. Tear line **160** may be provided by way of a tear strip.

The shape, size, and position of the loop formed by tear line **160** are not necessarily as shown in FIG. **1**A and may vary in different embodiments, depending on which portion of the resulting box should be removed. For example, the shape, size and position of the tear-line loop may be selected to meet requirements or balance factors such as ease of display and access, and maintaining box integrity during use. Multiple tear lines may also be used for removing a portion of the resulting box for these purposes.

For convenience of removing removable portion **162**, a notch portion **164** may be optionally provided at a convenient location along tear line **160**. For example, it may be convenient to position notch portion **164** on top panel **120** as shown in FIG. **1**A. More than one notch portions may also be provided in different embodiments. For ease of use, notch portion **164** may be pre-cut or partially severed (such as by a score line as depicted) so that it can be pushed out easily by a user using a finger.

As is typical for blanks used to form packaging boxes, the widths of front and back panels **110**, **130** are substantially the same, the lengths of front and back panels **110**, **130** are substantially the same, the widths of top and bottom panels **120**, **140** are substantially the same, and the lengths of top and bottom panels **120**, **140** are substantially the same, so that the resulting box will have a substantially rectangular or cubic shape. Boxes with a substantially rectangular or cubic shape may be convenient to handle and store in many situations.

The widths of flaps **123**, **124**, **143**, **144** extending from top and bottom panels **120**, **140** may also be substantially equal, and these flaps may be minor flaps. As used herein, minor flaps refer to flaps that do not meet in the middle in the formed box, as shown in FIGS. **1**C-**1**D. As depicted, there is a gap between each pair of flaps **123**, **143**, and **124**, **144**. In comparison, major flaps refer to flaps that can meet in the middle of the formed box. To provide minor flaps, the width of each flap **123**, **124**, **143**, **144** may be less than half of the length of front and back panels **110**, **130**. Minor flaps **123**, **124**, **143**, **144** are provided to form partially open sides of box **190**.

For reasons that will become clear below, in the present embodiment, the length of flaps **113**, **114**, **133**, **134** is longer than the length of front and back panels **110**, **130**, such as by about twice the blank thickness. A difference in length between flaps **113**, **114**, **133**, **134** and front and back panels **110**, **130** is necessary to provide side supports that are flush with the top and bottom of the resulting box as will be further described below. In cases where a blank has a varying thickness, the skilled person should be able to adjust the difference between the lengths of flaps **113**, **114**, **133**, **134** and panels **110**, **130** in view of the present disclosure to achieve a similar result.

Further, the width of front and back panels **110**, **130** is wider than the width of top and bottom panels **120**, **140**, such as by about four times of the blank thickness. This difference in width allows flaps **123**, **124**, **143**, **144** to be folded inside and fit between the top and bottom of the box to be formed, as can be appreciated by those skilled in the art.

In the present embodiment, to provide the necessary width difference between front and back panels **110**, **130** and top and bottom panels **120**, **140**, and length difference between flaps **113**, **114**, **133**, **134** and panels **110**, **130**, side edges **111**, **112**, **131**, **132** are transversely offset from side edges **121**, **122**, **141**, **142**, such as by about twice of the blank thickness, and each pair of adjacent flaps **113**, **114**, **123**, **124**, **133**, **134**, **143**, **144** is severed and separated by a slit cut **170**, **172**, **174**, **176**, **178**, or **180**, which is longitudinally offset from the respective fold line **150**, **151**, **152**, such as by about the box thickness. That is, each slit **170**, **172**, **174**, **176**, **178**, or **180** is offset from the closest one of fold lines **150**, **151**, **152** by about the box thickness. In other words, the end of each flap is offset from all fold lines **150**, **151**, **152** by at least about the box thickness.

A slit cut is a cut where little material is removed by the cut and the adjacent flaps may still be in contact with one another after the slit cut, or there may be only a narrow gap between the adjacent flaps after the slit cut. With such slit cuts, the adjacent flaps **113**, **114**, **123**, **124**, **133**, **134**, **143**, **144** are severed from one another but may still abut each other, as depicted in FIG. **1**A and better shown in the enlarged intersection of slit cut **180**, side edges **132**, **142**, and fold line **152** in FIG. **1**B.

As illustrated in FIG. **1**B, to offset slit **180** from fold line **152**, and offset side edge **132**, from side edge **142**, a small portion **182** of slit cut **180** is slanted with respect to fold line **152** and side edges **132**, **142**. The offset between slit **180** and fold line **152** may be about half of the offset between side edges **132**, **142**. The offsets may be designed to provide close fit between the respective panels and flaps in the resulting box.

Slit cuts allow the provision of flaps **113**, **114**, **133**, **134** that are taller than the height of panels **110**, **130**, and at the same time flaps **123**, **124**, **143**, **144** that can extend the full length between the front and back of the resulting box. As can be appreciated, when flaps **123**, **124**, **143**, **144** extend over the full length between the box front and back, they can improve or reinforce box integrity, and provide support when the box front and back are compressed towards one another.

In comparison, wider cuts sometimes referred to as slots in the literature are used in known blanks, as exemplified in WO 01/87721 to Maus and U.S. Pat. No. 7,784,676 to Borek et al., where the adjacent flaps are separated by a wide gap. With such wide gaps between the flaps as shown in these references, the length of each flap is shorter than, or equal to, the length of the panel to which the flap is attached.

Blank **100** may be formed of any suitable material for box blanks and packaging boxes. For example, corrugated boards, cardboard, paper board, fibreboard, or plastics may be used. Suitable material may include double faced corrugated cardboard. Other materials typically used for forming shipping or packaging boxes may be used. When a corrugated board is used to form blank **100**, the flute direction of the corrugated board may be substantially parallel to the lengthwise direction of blank **100**, or substantially parallel to fold lines **150**, **151**, **152**, so that the flute direction in the sides of the box to be formed is substantially vertical.

Glues or other adhesive materials or suitable configurations for attaching or fixing different parts of blank **100** may be additionally provided at the appropriate locations on blank **100**, if desired. In particular, glues or other adhesive materials may be applied to some or all of flaps **113**, **114**, **123**, **124**, **133**, **134**, **143**, **144** and **145**, as will be further discussed below.

Blank **100** may have any suitable thickness and size. As noted earlier, Blank **100** may have a substantially uniform thickness. In some embodiments, blank **100** may have a thickness from about 1 mm to about 5 mm. In a particular embodiment, blank **100** may have a thickness of about 3 or about 4 mm.

Blank **100** may be folded into a box **190**, as illustrated in FIG. **1**C, in selected embodiments. A box packing machine may be used to fold blank **100** and package box **190**.

In selected embodiments, panels **110**, **120**, **130**, **140** and end flap **145** may be first folded along fold lines **150**, **151**, **152**, **153** to form a tube shape. End flap **145** and a portion of front panel **110** may overlap and may be glued together, or otherwise attached to each other. For example, a hot melt adhesive may be used and may be applied using, for example, a hot glue gun.

Optionally, goods (not shown) to be packaged within the box, may be inserted into the tube from one or both of the open sides at this time.

Flaps **123**, **124**, **143**, **144** extending from top and bottom panels **120**, **140** are then folded inwardly along fold lines at side edges **121**, **122**, **141**, **142**, to form partial sides.

Next, flaps **113**, **114**, **133**, **134** extending from front and back panels are folded inwardly along fold lines **115**, **116**, **135**, **136** and glued or otherwise bonded to form double-layer supports **191**, **192**, **193**, **194**. Double-layer supports **191**, **192**, **193**, **194** are then folded inwardly along fold lines at side edges **111**, **112**, **131**, **132**, and glued or otherwise attached to the outside surfaces of respective partial sides formed by flaps **123**, **124**, **143**, **144**. This completes the formation of sides of box **190**, and thus box **190**.

Box **190** thus has a front formed from front panel **110**, a top formed from top panel **120**, a back formed from back panel **130**, a bottom formed from bottom panel **140**, and partially open sides formed from flaps **113**, **114**, **123**, **124**, **133**, **134**, **143**, **144**.

As now can be understood, the length of each flap **113**, **114**, **133**, **134** is the height of the corresponding support **191**, **192**, **193**, **194** when box **190** is in the up-right position. The length of front and back panels **110**, **130** is also their height when box **190** is in the up-right position. Thus, in this disclosure, for convenience of reference, the length of each flap **113**, **114**, **133**, **134** and front and back panels **110**, **130** may also be interchangeably referred to as its height.

As illustrated in FIG. **1**C, because the height of flaps **113**, **114**, **133**, **134** is taller than the height of front and back panels **110**, **130** and is appropriately selected, the top end of each side support **191**, **192**, **193**, and **194** is flush with the top of box **190**, and the bottom end of each side support **191**, **192**, **193**, and **194** is flush with the bottom of box **190**. It is to be understood that a top end of a side support is flush with the top of box **190** when it is substantially flush with the top surface of box **190** provided the top surface is substantially flat. Similarly, a bottom end of a side support is flush with the bottom of box **190** when it is substantially flush with the bottom surface of box **190** provided the bottom surface is substantially flat. The ends (or edges) of the side supports are considered flush with the top and bottom respectively as long as when the box is under vertical compression, the side supports **191**, **192**, **193**, and **194** bear at least part of the applied load before box **190** substantially deforms under the vertical compression.

A vertical compression may be applied during assembly, packaging, shipping, storage, or unpacking. For example,

when a machine is used to form and package the box, a vertical compression may need to be applied by the machine during the packaging process. When boxes are stacked for storage or transportation, a vertical compression may also be applied on the lower boxes.

Conveniently, side supports **191**, **192**, **193**, and **194** provide improved vertical support and resistance against deformation under vertical compression, as compared to boxes without full-height side supports.

As can be appreciated, when a corrugated board is used to form blank **100** and hence box **190**, and the flute direction is substantially parallel to the lengthwise direction of blank **100**, the flute direction (not shown) in the front, back and the side supports of box **190** as depicted in FIG. **1**C would be substantially vertical. Conveniently, such an orientation of the flute direction can provide increased vertical strength, as compared to other orientations of the flute direction.

Conveniently, double-layered supports provide improved resistance against vertical compression, as compared to a single layer side support that is of the same material and thickness. To provide even stronger support, side-supports may be formed with three or more layers, such, as by further folding flaps **113**, **114**, **133**, **134**. In some embodiments, however, single layer side supports may be sufficient, depending on the particular application and use.

For example, stronger side supports **191**, **192**, **193**, and **194** may be required when flaps **123**, **124**, **143**, **144** are sized such that there are gaps between them when they are folded to form partial sides of the box. In comparison, if flaps **123** and **143** abut or overlap with each other and flaps **124** and **144** abut or overlap with each other in the formed box, some side support can be provided by **123**, **124**, **143**, **144**. However, such a configuration will require more blank material and increase the weight of the blank and the box. Further, with such a configuration, the sides of the box are closed by the overlapping flaps, so that the content of the box is not visible from the side. In some applications, it may be desirable to be able to view the content in the box from the sides.

Also conveniently, when side supports **191**, **192**, **193**, and **194** are attached to the outside surfaces of flaps **123**, **124**, **143**, **144**, the internal space in box **190** can have a substantially regular shape, so that it may be convenient to package goods or products that have regular individual shapes, such as bars. In comparison, if side supports, such as folded side supports, are provided inside flaps **123**, **124**, **143**, **144**, the internal space in the box would be irregular due to protrusions formed by the side supports.

When two overlapping portions are to be attached, the overlapping portions may be glued, or may be stapled, taped, or otherwise attached or affixed together.

As noted above, the goods (not shown) to be packaged may be placed inside box **190** before the sides of box **190** are closed and sealed.

The partial openings on the sides of box **190** may allow partial viewing of the goods, and may reduce the materials needed to form box **190**. However, the openings should be shaped and sized to prevent the goods from falling out of box **190**.

Box **190** with the contained goods may then be transported or stored. For example, box **190** with the contained goods may be conveniently placed on a storage or display shelf.

Box **190** may be opened by tearing off removable portion **162** along tear line **160**. When notch portion **164** is provided, the user may push off notch portion **164** first and insert a finger into the resulting notch opening to facilitate tearing off and removal of portion **162**.

The remainder of box **190** forms a display box **195** with partially opened top and front, as shown in FIG. **1**D. Therefore, the goods (not shown) placed in box **190** become accessible and visible in box **195**. It is not necessary to remove the goods from box **190** or display box **195** to place them on the shelf, to view them, or to access them. A user can conveniently remove the goods from the partially open box **190**, either from the open front side or the open top.

In some embodiments, a portion of the top opening or front opening may be widened, such as to the full width of the box to allow easier removal of goods from the display box. An example box blank **200** and a corresponding display box **210** are shown in FIGS. **2**A and **2**B. With the exception of the shape of the tear line and the removable portion, box blank **200** is otherwise similar to box blank **100**, and display box **210** can be formed from blank **200** in a similar process as described above for forming display box **195** from blank **100**. The removable portion **202** is defined by a tear line **204** and has a widened portion **208** in the top panel **206**. The widened portion is of the full width of top panel **206** such that in display box **210**, the top opening **212** has a portion that spans the full width of the box to allow easy removal of goods, particularly goods of regular shapes and goods which have a length that is about the full width of the box **210**.

A further optional difference in blank **200** is that two notch portions **209** (as compared to one notch portion **164** in blank **100**) may be provided as depicted.

In a specific embodiment, the dimensions in blank **100** or **200** may be as shown in Table I.

TABLE I

Example Blank Dimensions

Component	Size (inches) Width	Length
Blank (overall)	23.44	54.874
Front and back panels	15.94	9.061
Top and bottom panels	15.31	17.501
Flaps on front and back panels	1.78 + 1.97 = 3.85	9.155
Flaps on top and bottom panels	4.06	17.376
End flap	15.31	1.781
Removable portion	12.56	19.56
widened portion of Removable portion	15.31	

In some embodiments, a relatively large portion of the top and front of the box can be removed, and as a result, relatively large items may be stored in the box on a shelf and may be conveniently displayed and removed from display box **195** or **210**.

As can be appreciated, when only a portion of the front and the top of box **195** or **210** is removed, the remaining portions connected to the back and side supports, can together conveniently provide structural support for confining the goods on display.

When side openings are provided in the box such as box **190**, the side openings may be conveniently utilized to handle the box, and to provide a viewing window for viewing the content in box **190** without opening it. Further, less material is needed as compared to a box with fully covered sides. Conveniently, the design of blank **100** allows the openings to be formed during assembly, without having to form openings in blank **100** during fabrication of the blank. The size and position of the openings may be conveniently adjusted by adjusting the sizes of the flaps.

Further, as depicted, blank **100** or **200** as a whole may be substantially rectangular. As such, it is easier to produce and

waste of material is limited during production, as compared to production of blanks that have irregular shapes and varying widths along their lengths.

In an exemplary embodiment, blank **100**, **200** or other blanks described herein may be formed using various different types of known methods and systems for forming such blanks, appropriately adapted to form the features disclosed herein.

For example, the making of a blank from a corrugated fibreboard material can start with first forming a sheet of corrugated material using a corrugator machine, such as one provided by BHS Corrugated, Maschinen-und Anlagenbau GmbH™. The corrugator machine may produce a length of corrugated material of a given width that can be used immediately or stored in a roll until it is ready to be utilized.

The next step may involve utilizing a roll or sheet of such corrugated material that may have an approximate width that may be the same as the width of the desired blank that may be used to form the box. The roll or sheet can be also cut transversely such as to create sections of cardboard that are generally rectangular in shape. The corrugated material may then be fed through what is known as a flexo-folder gluer machine. In passing through such a machine, the corrugated sheet may pass through a printer, which prints words or pictures on one or both sides of the sheet. Next, the material may be creased both across and along the sheet material such that when the blank is folded/erected it may easily bend along the crease (fold) lines to form the desired shape.

The creased sheet may then be slit with a cut device which cuts thin slits in the board at designed intervals along desired directions. These slits create flaps that may be folded.

Finally, the sheet material may go through a rotary die cutter to remove excess corrugated material along one end of the board and crush down a portion along a fold line, to create a thin "hinge". The purpose of the hinge is to later allow the board to be doubled back on itself (i.e. glue one end of the board to the other to create a tube) and glued.

At some stage of this process, a tear line may be formed in the blank such as by applying a device to create perforations in the blank. For example, a steel die may be pre-applied to a part of the blank to form the perforations.

The result up to this point can be a flat blank. Thereafter a flexo-folder gluer may apply glue to appropriate portions on the blank. The panels of the blank are then folded over by a folding mechanism such that one end of the blank is now glued to the other in a flattened tube-shaped orientation to create a flat tubular shaped blank.

After the tubular shaped blank has been created, it may be grouped with other blanks and shipped to another location where the boxes are to be erected and packed.

When it is desired to fill a box with one or more products, a two step operation may be required. First, the box can be erected from its knock-down configuration, either by hand or using a "case erector" machine. Examples of commercially available case erectors include case packers made by iPak Machinery Ltd.™

The second step may be the placing of the products into the formed case, either by hand or using a "case packer" machine. Examples of commercial case packers include case packers made by iPak Machinery Ltd.™ of Canada. The box can then be sealed with the products inside.

It may also be possible to utilize blanks that have not been formed into tubular forms in a first step, but rather using flat blanks and a wrap around machine. An example of a commercial wrap around machine is available from CERMAX™ of France. The wrap around machine, utilizing a flat blank, may place one or more products on one panel and then cause the remaining panels to be folded around and glued in sequence.

As can be understood, blank **100** or **200** may be modified without losing all of its benefits.

For example, a tear line may be provided by a tear strip, or in another suitable form. A tear line may refer to any line or elongated portion in the blank that is configured or adapted to facilitate the removal of a portion of the blank. Tear lines may be provided in the form of tear-away or tear-out strips, pull strips, tear- or pull-away tabs, perforation lines such as punch-out perforation lines, score lines, thinned or weakened strips or sections, or the like.

FIG. **3**A depicts a modified box blank **300**, exemplary of another embodiment of the present invention.

Blank **300** shown in FIG. **3**A is similar to blank **100** or **200**, except that front panel **310** and bottom panel **320** are terminal panels, and a removable portion **302** is provided by two separate tear lines **304** and **306**, which as depicted may be provided as tear strips. Panel **330** is the back panel and panel **340** is the top panel. As in blank **100**, side flaps **313**, **314**, **333** and **334** attached to front and back panels **310** and **330** are provided with fold lines **315**, **316**, **335** and **336** respectively and are taller than front and back panels **310** and **330**.

Blank **300** may be folded to form a box **350** as illustrated in FIG. **3**B, and then transformed to display box **360** as illustrated in FIG. **3**C by removing the removable portion **302** along tear lines **304** and **306**, in a similar manner as for forming box **190** and display box **195** or **210** from blank **100** or **200**. As in box **190** or display box **195** or **210**, in box **350** and display box **360**, double-layer side supports, such as supports **351** and **352**, are formed from side flaps **313**, **314**, **333** and **334**, and the side supports such as supports **351** and **352** are of the same height as the total height of the box. As illustrated in FIG. **3**B, the top end of each side support such as side support **351** or **352** is flush with the top of box **350**, and the bottom end of each side support is flush with the bottom of box **350**.

FIG. **4**A depicts another modified box blank **400**, exemplary of another embodiment of the present invention. Blank **400** shown in FIG. **4** is similar to blank **100**, except that no fold lines are provided on the side flaps **402** for forming side supports and no tear lines are provided for removing a portion of the box. Blank **400** may be folded to form a box **410** as illustrated in FIG. **4**B, in a similar manner as for forming box **190** from blank **100** with the exception that no side flaps **402** are double folded and the resulting side supports such as supports **412** are single layer supports. As depicted in FIG. **4**B, in box **410** formed from blank **400**, side supports **412** are still full-height supports, as in box **190**.

Conveniently, as illustrated above, a shipping and display container may be formed from a single blank according to exemplary embodiments disclosed herein. Thus, the manufacture and assembly process may be simplified as compared to boxes that are formed from multiple pieces of blanks. However, in different embodiments, additional components or attachments may be added to the blanks or assembled boxes, if desired.

As can be understood, the panels in the blank are typically substantially rectangular, as depicted in the drawings. The flaps may also be substantially rectangular, as depicted in the drawings. However, in different embodiments, one or more of the flaps and panels may have a different shape. For example, one or more flaps extending from the top and bottom panels may have a curved terminal edge.

One or more permanent openings may also be provided in one or more of the panels and flaps of the blanks for various purposes depending on the application.

It will also be understood that the word "a" or "an" is intended to mean "one or more" or "at least one", and any singular form is intended to include plurals herein.

It will be further understood that the term "comprise", including any variation thereof, is intended to be open-ended and means "include, but not limited to," unless otherwise specifically indicated to the contrary.

When a list of items is given herein with an "or" before the last item, any one of the listed items or any suitable combination of two or more of the listed items may be selected and used.

Of course, the above described embodiments are intended to be illustrative only and in no way limiting. The described embodiments are susceptible to many modifications of form, arrangement of parts, details and order of operation. The invention, rather, is intended to encompass all such modification within its scope, as defined by the claims.

What is claimed is:

1. A blank for forming a box, comprising:

a plurality of panels joined to one another at respective fold lines, said panels comprising a top panel for forming a box top, a bottom panel for forming a box bottom, a front panel for forming a box front and a back panel for forming a box back, each one of said panels having two side edges; and

a plurality of flaps each extending from one of said side edges, for forming box sides,

wherein flaps extending from said front and back panels are

as tall as a total height of the box to be formed from said blank before the box is deformed under vertical compression, or

taller than said front and back panels and have ends each offset from said fold lines by at least about a thickness of said blank.

2. The blank of claim **1**, wherein a fold line is provided on each flap extending from said front panel or said back panel, for folding said each flap along said fold line to form a double-layer support.

3. The blank of claim **2**, wherein said fold line on said each flap is configured for folding said each flap inward.

4. The blank of claim **1**, comprising a tear line defining a removable portion in said top and front panels, for removing said portion from said box along said tear line.

5. The blank of claim **1**, wherein said blank has a substantially uniform thickness.

6. The blank of claim **5**, wherein said flaps are separated from one another by slits.

7. The blank of claim **1**, wherein flaps extending from said top and bottom panels are minor flaps.

8. The blank of claim **1**, wherein said blank is formed of a corrugated cardboard having a flute direction substantially perpendicular to said fold lines joining said panels.

9. A box comprising:

a top, a bottom, a front, a back, and

two sides each comprising a top flap extending downward from said top, a bottom flap extending upward from said bottom, a back flap extending forward from said back, and a front flap extending rearward from said front,

wherein said back and front flaps are affixed to outside surfaces of said top and bottom flaps, and before said box is deformed under vertical compression said back and front flaps

are as tall as a total height of said box, or

have top and bottom ends flush with said top and bottom respectively.

10. The box of claim **9**, wherein said front and back flaps are folded inwardly to form double-layer supports.

11. The box of claim **9**, wherein said front and back flaps are glued to said outside surfaces of said top and bottom flaps.

12. The box of claim **9**, comprising a tear-line for removing a portion of said top and a portion of said front.

13. The box of claim **9**, wherein said top and bottom flaps are minor flaps.

14. The box of claim **9**, wherein said box is formed of a corrugated cardboard, and the flute directions in said front and back flaps are substantially vertical.

15. A process for forming a box from a blank comprising at least four panels and flaps extending from opposite edges of each one of said four panels, wherein said four panels are foldable to form a top, a bottom, a front and a back of the box, said process comprising:

folding flaps extending from said top and bottom to form two partial sides; and

folding each flap extending from said front or back to form a side support and attaching said side support to an outside surface of a respective one of said partial sides,

wherein said blank is configured such that before said box is deformed under vertical compression said side support

is as tall as a total height of said box, or

has a top end flush with said top and has a bottom end flush with said bottom.

16. The process of claim **15**, wherein said each flap extending from said front or back is folded to form a double-layer side support.

17. The process of claim **15**, wherein said attaching comprises bonding with an adhesive.

* * * * *